



**ENGINEERS  
AUSTRALIA**  
Northern Division

## **Submission for an Historic Engineering Marker (HEM)**

# **Stokes Hill Steam-driven Oil Pump House**

**Stokes Hill Wharf  
Darwin Northern Territory**

**March 2003**

Contact Details:

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### **Stokes Hill Steam-driven Oil Pump House**

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#### **Attachments**

Letter of Approval from Owner

Photographs from the Honecker Collection

Peter Dermoudy's Report "Steam Pump House" April 1989

## Statement of Significance

The Steam-driven Oil Pump House is one of the few remaining vestiges of a precinct which has great significance in the development of Darwin. Its establishment was part of the infrastructure to support a broader plan by the Navy to convert their coal-driven ships to oil. The relocation of the refuelling facility from Thursday Island to Darwin in the late 1920s had a lasting effect on the future of the city, through the development of its military infrastructure and strategic importance.

The pumps were used to transfer fuel oil to and from ships at Stokes Hill Wharf and the oil storage tanks nearby. There are several major factors which enhance its significance. Firstly it is directly connected with one of the most dramatic episodes of Australian history – the bombing of Darwin in 1942. Secondly the pump house is a classic example of late Victorian steam engineering incorporating all the characteristics of ruggedness and long life for which this era is remembered. Thirdly it is located close to important tourist facilities in the Stokes Hill Wharf Precinct, adjacent to Darwin City.

The whole installation of the Steam-driven Oil Pump House is very much as it was originally conceived and built, only the boiler installation has been modernised. The building is unremarkable in appearance, but having survived the Second World War and several cyclones over the last 70 years it gives an aura of permanency. It represents pragmatic, well-proven and reliable engineering. The works are in good condition and with the exception of the boiler, are in workable order.

The principal machinery features are the two main oil pumps which were manufactured by Kelly & Lewis in Melbourne in 1927 and the boiler feed pumps which were manufactured by G & J Weir of Cathcart, Glasgow in 1925/6.

The Northern Territory government is redeveloping the Stokes Hill Wharf Precinct area as a tourist, entertainment and commercial area. The Historic Engineering Marker plaque will serve to highlight the engineering significance of the Steam-driven Oil Pump House and the part it played in the development of Darwin.

## Citation

### STOKES HILL STEAM-DRIVEN OIL PUMP HOUSE

This steam-driven fuel oil pump house was part of the 1926 changeover of strategic refuelling bases from Thursday Island to Darwin. The change accompanied the conversion from coal to oil as fuel for Navy ships. It represents an important milestone in the development of Fortress Darwin and is a reminder of early developments of an Australian defence strategy. The pump house survived the devastating bombing of Darwin during the Second World War.

**Proposed plaque will be placed at the site.**



## Commemorative Plaque Nomination Form

**To:**

Commemorative Plaque Sub-Committee  
Engineering Heritage Australia  
The Institution of Engineers Australia  
11 National Circuit  
BARTON ACT 2600

Date: March 2003

From: The Institution of Engineers,  
Australia, Northern Division

**The following work is nominated for an Historic Engineering Marker**

**Name of Work:** Stokes Hill Steam-driven Oil Pump House

**Location, including address and map grid reference:**

Street Address: Stokes Hill Wharf, Darwin, NT 0800  
Lot 5251 of Town of Darwin. Survey Plan: S 79/011G  
Map Reference: Code 200 Scale 002500 Sheet 30.21  
Grid Reference: GDA94: 701 100E 8 621 150N. Lat: 12° 27' 59" S Long: 130° 51' 01" E

**Owner**

Title Register 631 599. Estate in Fee Simple owned by the Northern Territory of Australia.

Declared a Heritage Place under the Heritage Conservation Act NTG 25/11/92

The Northern Territory Government Heritage Branch has been advised of the nomination of the work and has indicated approval for the submission and the placement of the Historic Engineering Marker at the site. A copy of the approval letter is attached.

**Access to Site**

There is currently limited access to the site by the public. Its location is central to the Stokes Hill Wharf Precinct which has undergone upgrading in recent years to increase tourist and local community use of the area, including access to included sites of heritage significance.

Improved access to the site is achievable and could include erecting a viewing platform outside the building with interpretive signage and minor modifications to the window glass to enable the public to view the machinery inside the Pump House. Once these minor works have been undertaken, the site would be a welcome addition to the Stokes Hill Wharf Precinct providing a further place of interest for visitation.

**Future Care and Maintenance of the Work**

A volunteer group entitled the 'Friends of Stokes Hill Steam Pump House' would be formed, comprising interested individuals and key stakeholders. This group would undertake the preparation of a Conservation Plan and the ongoing management of the site based on this plan. The group would be supported by the Institution of Engineers, Australia, Northern Division.

**Name of Sponsor**

Institution of Engineers Australia, Northern Division.



Chairperson of Northern Division Heritage Group

## **Additional Supporting Information**

**Name of Work:** Stokes Hill Steam-driven Oil Pump House

**Year of Construction or Manufacture:** 1927/28

**Period of Operation:** 1928 – 1989

### **Physical Condition:**

The building requires repair to reinforced concrete columns although this was not considered a safety issue in 1989. It has apparently had no routine maintenance for a considerable time. The pumping machinery is thought to be in near operational condition and had been maintained up until it was removed from service in 1989. The machinery requires cleaning and painting. The Northern Division has secured a minor grant of \$2,000 for this purpose and this work will be undertaken as soon as practicable.

The present (replacement) boiler has been out of service for at least 14 years and has seen little service since it was installed in 1963. It is possible that it could be returned to steam but would probably require professional repair work. Its last annual certification was in 1987.

### **Engineering Heritage Significance:**

In the 1920s military strategists decided to dismantle the Navy's coal refuelling station on Thursday Island and physically relocate the facility in Darwin. The Navy had switched from coal to oil fuel in 1923, so the new refuelling station to be built in Darwin commenced around 1924 with the construction of a series of four oil storage tanks. This was to be followed by the construction of fortresses and barracks to defend the tanks.

Work began on the Steam Pump House in late 1927 and was completed ready for testing the two boilers and the two main steam pumps about March 1928. Its first real task was to fill the completed Tank No. 1 with 7,896 tonnes of Borneo oil from the tanker 'War Krishna' on 16<sup>th</sup> July 1928. Barely 3 weeks later, on 4<sup>th</sup> August, Tank No 2 was filled from the same ship.

In 1932, a decision was made to increase the number of oil tanks to nine and to re-open the Naval Reserve after twelve years of inactivity. By 1939, with war imminent, another two tanks were contracted out, with both being completed by December 1941.

In the years leading up to the war, Darwin had been considered, by military experts, as 'low risk' with the British relying on a fortified Singapore base to be kept in readiness to receive the British fleet should problems arise. Suggestions to develop Darwin as a key strategic place to help defend Australia and New Zealand were disregarded as being too expensive. Apparently nothing had been learnt of the dangers of aerial warfare from the First World War.

On 19<sup>th</sup> February 1942, Darwin was bombed by the Japanese and the wharf area sustained catastrophic damage including the sinking of many ships including the tanker 'British Motorist' which only three days earlier had discharged her cargo of 10,895.59 tonnes of Iranian oil to Tank No. 10. In the raid, a number of oil storage tanks were destroyed or damaged, but there was enough oil to supply USAAF 808<sup>th</sup> Engineers with 286.69 tonnes on 31<sup>st</sup> March. The Steam Pump House suffered only minor damage and played an integral part in the refuelling.



Having fulfilled a valuable role in the social, military and engineering heritage of Darwin the Steam Pump House is representative of a conscious decision to adopt 'modern' technology and had a major impact on the growth and development of the City of Darwin. It is also one of the few remaining structures in the precinct to have survived the 19<sup>th</sup> February 1942 and subsequent aerial bombing raids.

### **Technological/Scientific Value:**

#### **1. The Main Pumps.**

The two main oil pumps were manufactured by Kelly & Lewis in Melbourne in 1927. They consist of an integrated pump/steam engine unit generally described as a horizontal duplex non-rotative steam pumping engine. The engines were fed with live steam and expanded this in a pair of double-acting, side-by-side cylinders which exhausted to atmosphere. The pumps were of a double-acting piston type with the pump body containing a number of "mushroom" valves on both the suction and delivery sides. These valves are faced with rubber or gutta percha to obtain a tight seal. The output of the pumps could be regulated by manually changing the number of strokes per minute of the pumps. The valves on the steam cylinders were controlled by taking motion from the oscillating piston rods between the steam and oil cylinders.

This kind of pump originated in America and was patented by Henry Rossiter Worthington in 1844. Worthington made improvements to the valve-gear arrangement in 1849<sup>1</sup>. Many manufacturers adopted the design and pumps of this type were made in great numbers from the 1870's until the end of the steam era (say at the time of the Second World War). This type of pump was manufactured in many sizes from smaller than the Stokes Hill pumps to very large sizes. Pumps of this type were used for all manner of fluids including water pumping, oil pumping and transport of various liquids in industrial processes. The pumps could be configured to provide different combinations of delivery pressure and volume by varying the diameter of the pump cylinders during manufacture. Pumps of this type could handle quite viscous fluids including oils at the heavy end of the range such as residual fuel oil.

Whilst the Stokes Hill pumps were not unusual in their time the fact that they survived in operation for so long and have been preserved in good condition since being decommissioned is more remarkable. Complete steam installations of almost any type are increasingly unusual anywhere in the world.

The Stokes Hill installation has several major factors which increase its significance. Firstly it is directly connected with one of the most dramatic episodes of Australian history – the bombing of Darwin in 1942. Despite being a central part of the Naval strategic infrastructure of the time, it survived and formed part of the following massive military build-up and the operations to push the Japanese back through "the islands". Secondly the pumping station is a classic example of late Victorian steam engineering incorporating all the characteristics of ruggedness and long life for which this era is remembered. Thirdly, by good chance, it is located close to important tourist facilities in the Stokes Hill Wharf Precinct and only a stone's throw from the centre of the city.

#### **2. The Boiler Feed Pumps.**

The two feed pumps were manufactured by G & J Weir of Cathcart, Glasgow in 1925/6<sup>2</sup>. The Weir feed pumps, which form an integral part of the installation, are amongst the most common

<sup>1</sup> S C Walker, *The Pump*, Magnus Publications, 1995, pp78-80

<sup>2</sup> Peter Dermoudy, *Steam Pump House Stokes Hill*, Report for Power and Water Authority, April 1989



type of steam driven pumping engine manufactured and they endured well into the age of the steam turbine in many applications.

The pumps are vertical single cylinder non-rotative steam pumping engines with the steam cylinder located above the pump. The output of the pumps could be regulated by manually changing the number of strokes per minute made by the pumps. The valves on the steam cylinders were controlled by taking motion from the oscillating piston rod between the steam and water cylinders.

This type of pump was used very widely as a boiler feed pump, that is a pump used to pump water into a boiler against the pressure of steam already in the boiler. This is an exacting duty requiring accurate control and high reliability. The simplicity and rugged construction of the Weir pump made it ideal for this application.

The Weir pump was found particularly in ships, carrying out a vast range of functions. In a typical engine room of a steamship powered by reciprocating engines there would be several Weir pumps of various sizes carrying out such duties as boiler feed pumps, furnace oil pumps, bilge pumps, cargo transfer pumps, fire pumps and sometimes circulating water (condenser cooling water) pumps. Such pumps would have been very familiar to sailors in Navy engine rooms and hence were a very appropriate choice for this land-based naval installation.

### 3. Summary.

The whole installation of the Stokes Hill Steam-driven Pump House is very much as it was originally conceived and built. Only the boiler installation has been modernised. It represents pragmatic, well proven and reliable military engineering which proved itself under fire and defied a fanatical enemy.

The technology is not old in steam terms, having been constructed about one and a half centuries after James Watt's world-changing patents. Neither did it have an extraordinarily long service life (62 years) in comparison with other steam installations where it is not hard to find examples which served for over a century with minimal change and only routine maintenance.

Nevertheless these old engines are clearly from a by-gone era. In the modern world where naval ships are powered by gas turbine engines and are armed with guided missiles controlled by communications and information technology systems of immense complexity and precision, it is difficult to relate the pivotal role of installations like the Stokes Hill Steam-driven Pump House to the needs of a modern navy.

### Historical Value:

The Steam Pump House is one of the few remaining vestiges of a precinct which has great historical, military and social significance for Darwin. Its establishment was part of the infrastructure to support a broader plan by the Australian Navy to convert their coal-driven ships to oil-driven ships. The relocation of the refuelling facility from Thursday Island to Darwin in the late 1920's had a profound effect on the development of the city, through the gradual development of its military infrastructure and strategic importance. Whilst many other structures within the precinct have gone, the Steam Pump House remains intact and protected by heritage legislation. The Underground Oil Storage Tunnels, which have been preserved and are a popular tourist attraction, complement the Steam Pump House.

### **Social Value:**

The Steam Pump House is fairly unknown by the wider community as there is currently limited access and it is not in the direct thoroughfare of the Stokes Hill Wharf Precinct.

Darwin, however, being the only Australian city to be bombed in the Second World War, has a proud military heritage sustained by a number of museums and in situ military relics. These provide locals with a strong sense of identity supported by stories handed down by family and friends who were either living in Darwin or stationed nearby during wartime. The role of the Steam Pump House in its war service alone guarantees its place in social history.

Its industrial heritage value will be particularly appreciated by engineers, steam enthusiasts, historians and within the military. With appropriate access and interpretation, the Steam Pump House could play an important role for the wider community in conserving the heritage value of the area.

The Northern Territory Government recently undertook a public consultation with a view to the future development and presentation of the Stokes Hill Wharf Precinct. As part of this consultation, The Institution of Engineers, Australia, Northern Division made a submission which highlighted the engineering and social values of this site. Given that the Precinct is also of great tourism and commercial value, it would serve the community to incorporate elements of historical conservation that enhance and complement future development.

### **Landscape or Townscape Value:**

The building is quite unremarkable in appearance, lacking architectural style and detail. It shows a rather ad hoc approach indicating, perhaps, a lack of detailed drawings or changes brought about on site by non-delivery of certain essential materials or equipment. Having survived the Second World War bombing and several major cyclones including the great cyclone of 1937 and Cyclone Tracy however, gives it an aura of permanency and functionality that has been somewhat lacking in Darwin's built environment.

Its location in a prime tourist and commercial precinct, in proximity to a related historical tourist attraction (Underground Oil Storage Tunnels) lends itself to a Conservation and Interpretation plan that ensures its positive contribution to the landscape.

### **Rarity:**

The equipment used in the Pump House was quite common technology at the time (perhaps even a little out of date!) but the fact that the entire installation, in context with the remaining tanks and other war relics have survived intact, makes the site unique. The works are in good condition and need only minor maintenance (ie cleaning, repainting) to bring them to a highly presentable condition.

### **Representativeness:**

The Steam Pump House is representative of an important stage in the development of Darwin, as a component of the Oil Storage and Refuelling Facility for the Royal Australian Navy. This pre-empted the build up of Darwin's military presence, initially to protect the facility, and later becoming a target for bombing during the Second World War. Importantly also, the development of this facility was part of the infrastructure that supported a major technological change for the military - that being the changeover from coal-driven to oil-driven ships.



The actual equipment housed within the Pump House, provide excellent in situ specimens of the steam pump technology of the time, and modifications made over the years to keep the facility operating illustrate the integration of developing technology for a particular function over a specific period.

### **Contribution to the Nation or the Region:**

The Steam Pump House is one of the few retainable landmarks of the Oil Storage Facility established in the 1920's to service Australia's navy ships. Realising its strategic importance, a fortress and barracks were established at Emery Point, East Point and Myilly Terrace to protect the facility, thus contributing to the development of the fledgling City of Darwin.

### **Contribution to Engineering:**

The installation does not have any unique design characteristics or features of an unusual engineering nature. It represents 'good current practice' for its time. It was intended to be a reliable, simple, work-a-day installation that sailors could operate and which could be maintained and repaired in a difficult environment. The lack of 'fanciness' or 'innovation' marks it as achieving its purpose – an engineering solution to a particular set of circumstances.

### **Integrity:**

The Steam Pump House has been used only for the purpose for which it was designed, and after decommissioning has been left with all equipment intact, in place and in good condition. All modifications have been made to maintain operational integrity over six decades of use.

Thus the integrity of the site is extremely high, with only minor cleaning and maintenance required to bring it back to its condition at the time of its decommissioning. All equipment with the exception of the boiler are in workable condition and with appropriate expertise could be maintained.

### **Authenticity:**

All equipment contained within the Steam Pump House has appropriate manufacturers markings, and archival material includes original drawings and specifications for equipment. Site plans and drawings prepared for the Oil Storage Facility are also available. Noted historical architect Peter Dermoudy has prepared measured drawings of the building and a photographic record of the site and equipment. A copy of the report is attached to this submission.

### **Comparable Works in Australia or Overseas:**

There were undoubtedly many similar installations throughout the world at the time of construction. We are not aware of any other survivors in Australia, but steam plant in Australia is not fully documented. Whilst we are aware of similar installations in the USA and Great Britain, there is no complete register that can be referred to.

**Attachments to Submission:**

- Steam Pump House Stokes Hill, a Report for the Northern Territory Power and Water Authority by Peter Dermoudy, 1989.
- Letter from site owner – Northern Territory Government.
- Photographs of site during construction from the Honecker Collection, Northern Territory Library.

**References:**

1. S C Walker, The Pump, Magnus Publications, 1995, pages 78-80.
2. Peter Dermoudy, Steam Pump House Stokes Hill, Report for Power and Water Authority, April 1989.





29 NOV 2002

MINISTER FOR THE ENVIRONMENT AND HERITAGE

PARLIAMENT HOUSE  
STATE SQUARE  
DARWIN NT 0800

GPO BOX 3146  
DARWIN NT 0801  
TELEPHONE: (08) 8901 4161  
FACSIMILE: (08) 8901 4165

Ms Janice Lake  
Director, Northern Division  
Institution of Engineers, Australia  
GPO Box 417  
DARWIN NT 0801

Dear Ms Lake

I, Christopher Bruce Burns, having received comments from the Heritage Advisory Council and in accordance with section 39K of the *Heritage Conservation Act*, hereby authorise the installation of commemorative plaques at the Steam Pump House, a declared heritage place located at Lot 5251, Town of Darwin, and at the Adelaide River Railway Bridge, located within Lot 194 (A), Town of Adelaide River; provided that the following conditions are met:

- (1) That all appropriate permits for access to the sites are received from the owners in writing prior to the installations proceeding;
- (2) That my Office of Environment and Heritage gives final approval for the text of the plaques prior to their installation;
- (3) That my Office of Environment and Heritage is notified of the start date of the works prior to their commencement; and
- (4) That my Office of Environment and Heritage is provided photographs depicting the plaques upon completion of the installation.

Please note that this permit constitutes relief from any potential prosecution under the terms of the *Heritage Conservation Act* 1991 only for the works specified. It does not provide any right or authority, directly or by implication, to enter land or access property to which the permit applies. Separate permits for access will be required as appropriate to the two subject sites.

Yours sincerely

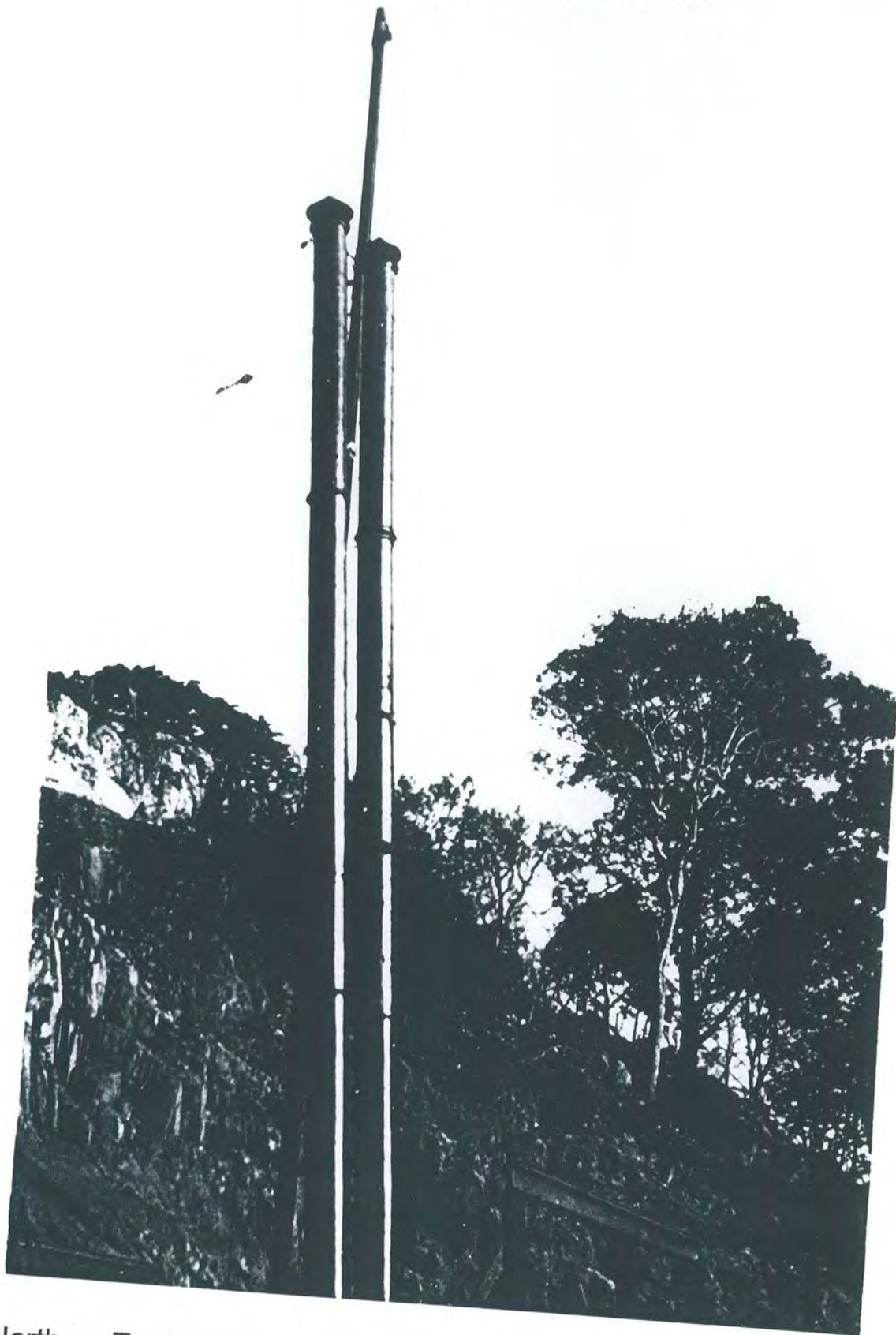
CHRIS BURNS

25 NOV 2002



Northern Territory Government

# Pump House Stacks



Northern Territory Library and Information Services – Territory Images

File: 33/33827

Title: Pump house stacks

Date: 192?

Creator: Honecker

Description: Pump House stacks, oil tanks Darwin

PhotoNumber: PH0392/0011

Collection: Honecker Collection

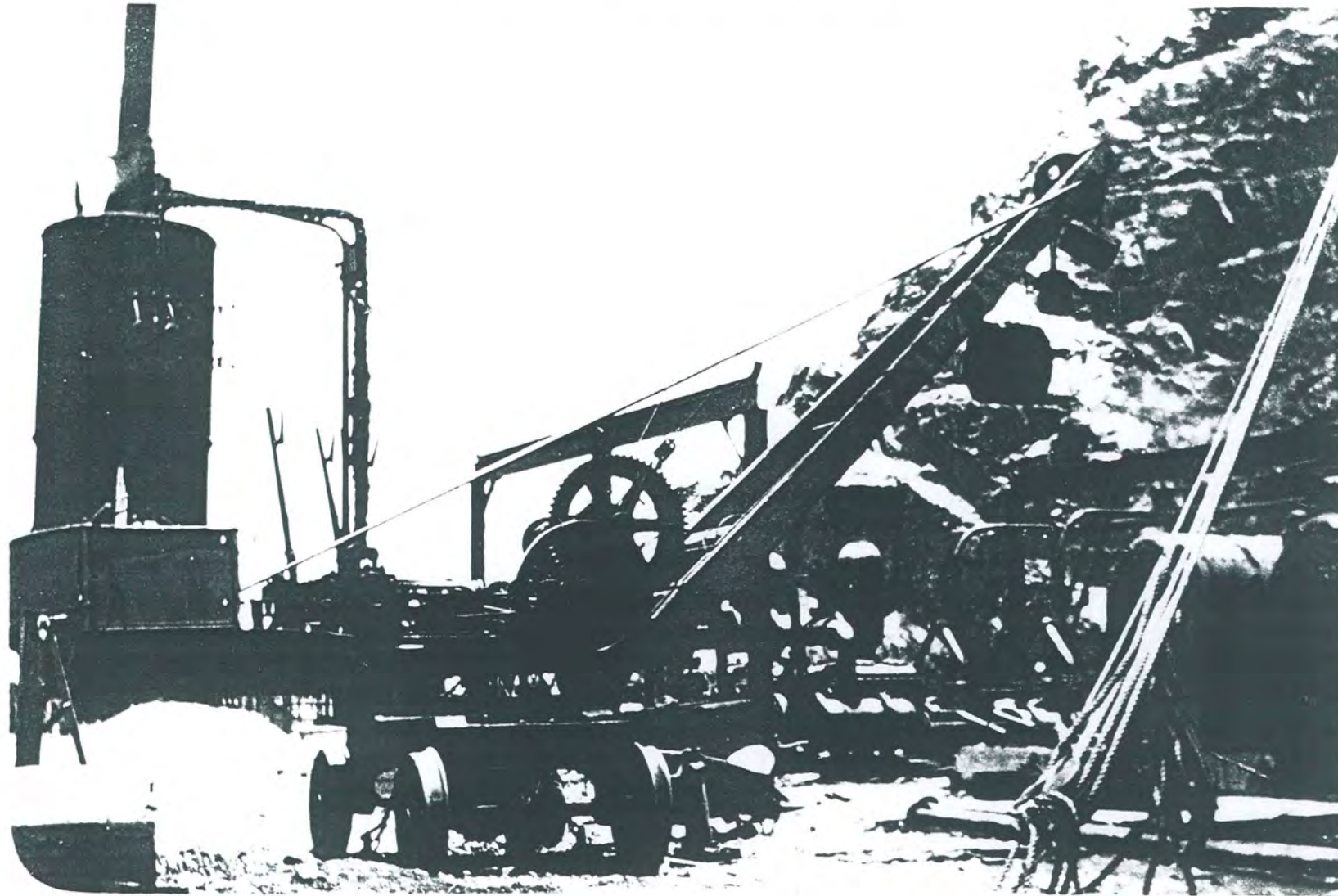
Copying: NTL

Location: Darwin, Port Darwin, Dinah Beach

Subjects: Oil storage tanks, pumping station



# Pump House Boilers



Northern Territory Library and Information Services – Territory Images

File: 33/33828  
Date: 192?  
Copying: NTL

Title: Pump house boilers  
PhotoNumber: PH0392/0012  
Location: Darwin, Port Darwin, Dinah Beach

Description: Pump House boilers and crane oil tanks  
Creator: Honecker  
Collection: Honecker Collection  
Subjects: Oil storage tanks, pumping machinery - erecting work



# Pump House Machinery



Northern Territory Library and Information Services – Territory Images

File: 33/33826 Title: Pump house machinery  
taken before house was built.  
Date: 192? PhotoNumber: PH0392/0010  
Location: Darwin, Port Darwin, Dinah Beach

Description: Birds eye view of pump house machinery during oil tank construction. Picture  
Creator: Honecker Collection: Honecker Collection Copying: NTL  
Subjects: Oil storage tanks, pumping machinery



**STEAM PUMP HOUSE**

**STOKES HILL**

**DARWIN**

**A REPORT FOR THE NORTHERN TERRITORY  
POWER AND WATER AUTHORITY**

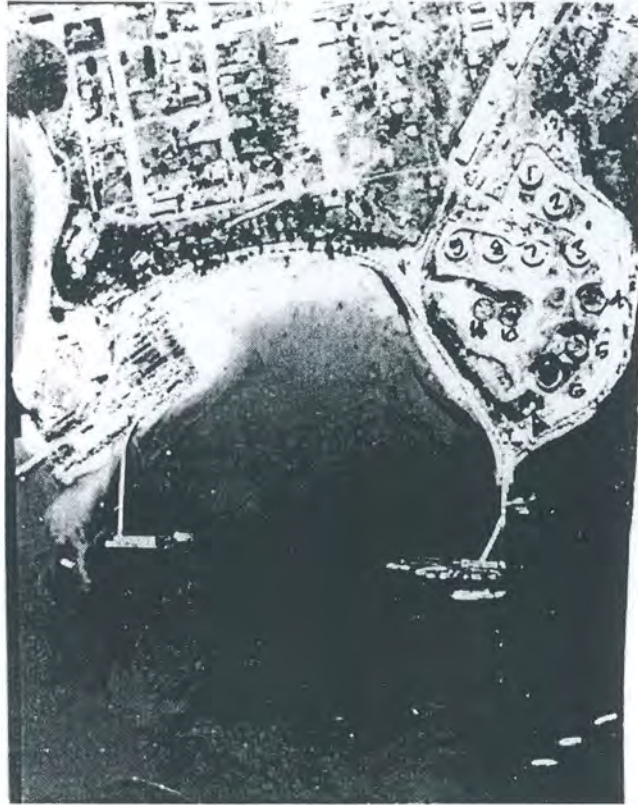
**PETER DERMOUDY**

**52 TEMIRA CRESCENT  
DARWIN**

**GPO BOX 1573  
DARWIN NT 0801**

**APRIL 1989**

## STEAM PUMP HOUSE – STOKES HILL



*Steam Pump House south of  
destroyed Tank No. 6*

From June 1884 when the first Japanese pearl divers arrived in Darwin, a certain sense of vulnerability to attack from “The North” has pervaded the minds of Australian defence strategists.

This fear was also felt by the British, who had their colonial interests and who kept a parental eye on their “outpost”. Numerous intelligence reports and assessments of Australia’s defence capability were prepared by the British for their own benefit and indirectly for influencing the Australian Government.

One such assessment by Field Marshall Viscount Kitchener, in 1911, stated that Darwin had only one strategic advantage. It was a capable landing place.



A Naval Reserve District was declared for Darwin on 1911 and manned by a crew of three.

This defence force was added to in World War I by the formation of a volunteer machine gun unit – the Cable Guard, whose responsibility was to guard the cable station and Submarine cable which linked Australia to Singapore and places west.

British Naval strategist, Viscount Jellicoe, in 1919 mooted Darwin as one of three Australian sub bases for a large Far Eastern Naval Fleet which would have Singapore as its main base. His plan was rejected as over reactive and far too expensive for either Britain or Australia to undertake.

The Secretary of the Department of the Navy in a 7 September 1920 memo to the Secretary, Department of Defence, felt that coastal defences for the N.T. were not necessary. Thursday Island, a coaling station and sentinel in the straits between Australia and New Guinea, was still high on his strategical list.

Thursday Island had been a defended coaling station since 1891 in preparation for an expected Russian invasion. Armaments had been provided by the British Government and consisted of three six inch (150mm) breech loading guns and 9 pounder rifle muzzle loading guns.



The manufacturer's date of 1808 can still be seen on the now abandoned six inch guns. The Fort was manned originally by two officers and men of the Queensland Permanent Artillery who lived in two storied timber framed barracks.

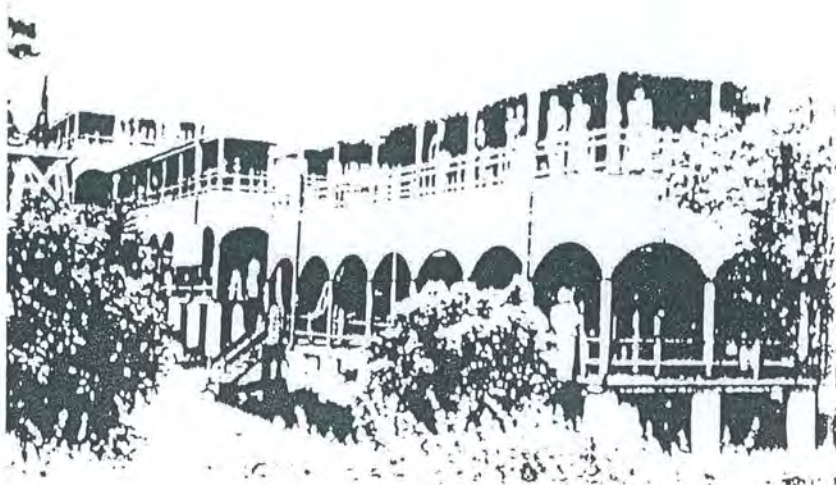
Jellicoe's 1919 plan was finally reduced, during the 1923 Imperial Conference, to delete all thoughts of an independent Far Eastern Naval Fleet in favour of relying on a fortified Singapore base to be kept on readiness to receive a quickly despatched British Fleet should a problem arise, Australia and New Zealand, were to look after minor problems such as landings and minor invasions themselves until the might of England could be brought to bear on the adversary.



To this end a refuelling depot to service the British Fleet was to be established in the Darwin Area (Bynoe Harbour was the suggested site but rejected by the Australian Government on economic grounds).

The 1923 Singapore decision and the switch by the Navy from coal to oil fuel led to the eventual closure of the Thursday Island Naval Installations. This swing began in 1924 with the construction of a series of oil storage tanks in Darwin and the foreseen need to defend them.

Over the period 1932-33 the island's barracks were partially dismantled by a party of Australian Engineers for reuse in Darwin in the construction of fortresses and allied barracks at Emery Point, East Point and Myilly Terrace.



*Thursday Island Barracks  
before dismantling began*

Four tanks had been completed and filled by October 1929 as part of a five year plan proposed by Admiral Sir Reginald Henderson, Royal Navy, in response to the Australian Government's request for him to advise of Naval Strength and preparedness.

In 1927 the Navy still considered Darwin to be a low risk and estimated that the Garrison with 20-30 men to maintain the 2 x 9.2 inch and 2 x 6 inch guns in peacetime would be enough to put up a fight in a surprise raid. (Extract from R.C. Handcock R.N. 15/6/27).

The actual siting of the tanks behind Stokes Hill was believed in the first instance to be protection from naval bombardment from harbour approaches and a battery of coastal guns located on the harbour entrance would be the ultimate defence.

Apparently nothing had been learnt of the dangers of aerial warfare from World War I.





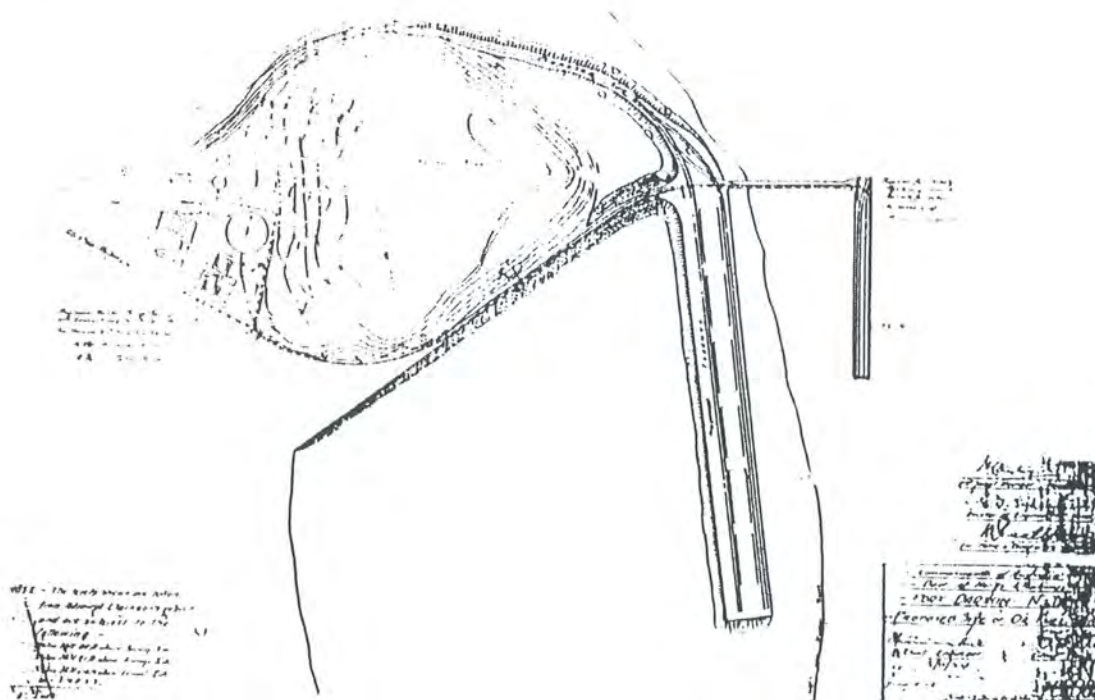
1938 View of Oil Fuel Installation

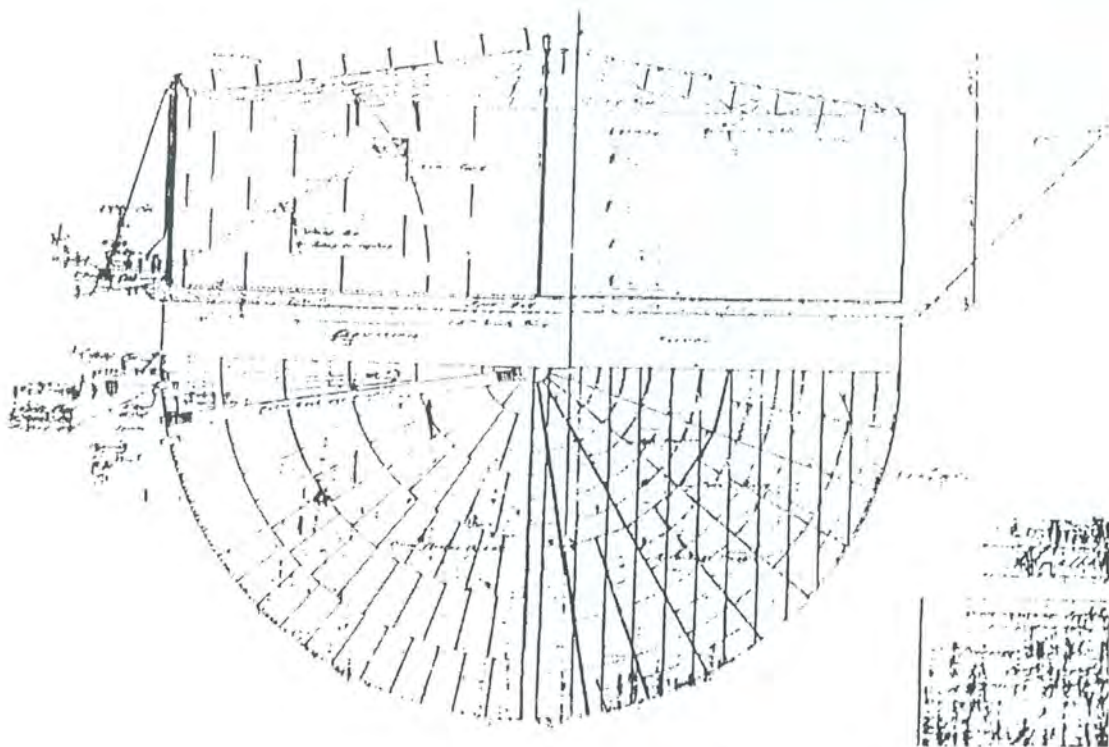
In the period between 1919-1926 four separate consultants were engaged to prepare development schemes for the Stokes Hill area from the railway yards to the wharf.

The first, in 1919, was J. Riseley Settle, Director of Navel Works, followed by Engineer Vice Admiral Sir William Clarkson RAN, then J. Ramsbotham, Director of lighthouses and finally, in 1926, Sir George Buchanan. The latter's Scheme "B" included an area set aside for oil storage tanks on the northern side of Stokes Hill.

Clarkson's input is not entirely understood but his report is clearly alluded to in an early drawing prepared by the Commonwealth Department of Works and Railways in November 1924.

This drawing shows one 8,000 ton oil tank and one 450 ton petrol tank drawn with firm lines and eight tanks drawn with broken lines.





The 8,000 ton (8,128 tonne) tanks as designed at the time were to be 35.36m diameter by 9.14m high of riveted steel construction.

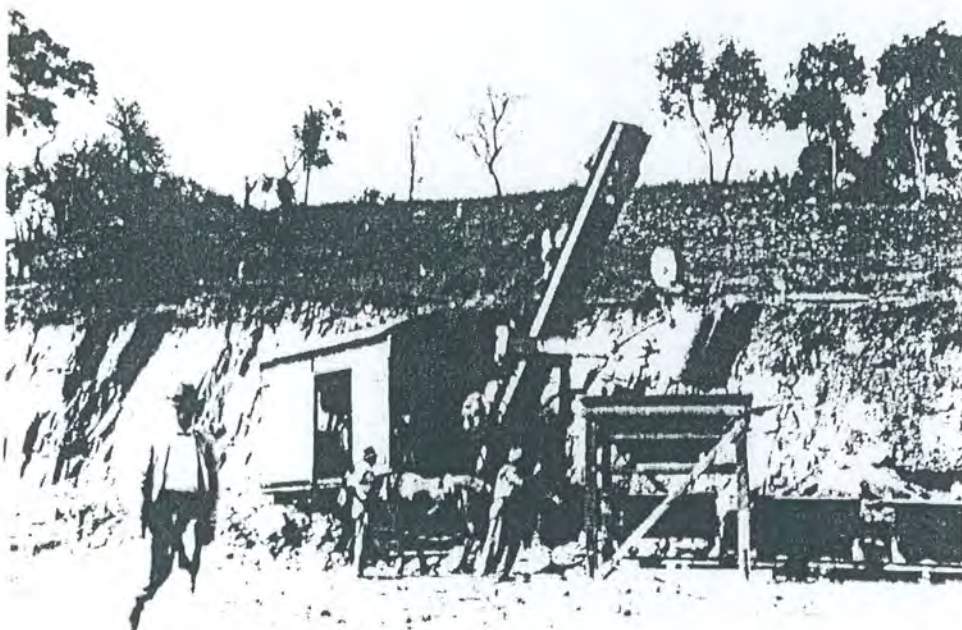
Obviously detail changes were made to the final layout of the tanks before a start was made on excavations in early 1926.

Four tanks were initially planned beginning with No. 1 closest to the railway yards (and the most northern) with Nos. 2, 3 and 4 progressing in a clockwise direction around the base of the fill.

No. 3 tank was almost directly in line with the ex Naval hulk "Warrego" which had been blow ashore in 1918.





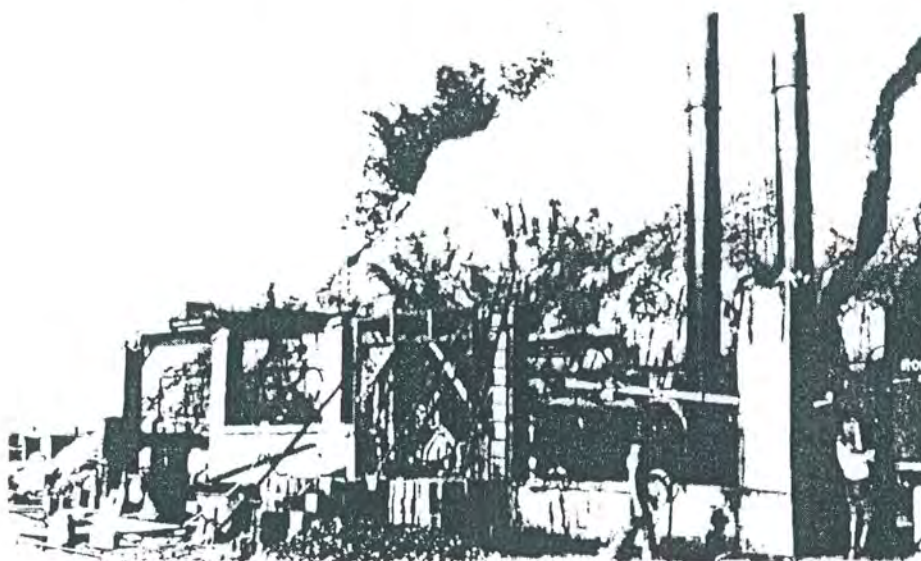


*Ruston mechanical shovel excavating for Tank No. 3 on 22 August 1927  
NT Museum col. PF4*

Excavations for pipelines and the construction of a pumping station to transfer fuel between ships and tanks also had to be carried out to complete the installation.

Work began on the Steam Pump House, SITE 12, in late 1927 and was completed ready for testing the two boilers and the two main steam pumps about March 1928.

The first real task was to fill the completed Tank No. 1 with 7,896 tonnes of Borneo oil from the tanker "War Krishna" on 16 July 1928. Barely three weeks later, on 4 August, Tank No. 2 was filled from the same ship.



*Building Steam Pump House. 27 January 1928. N.T. Museum col. PF7*



*Labour intensive site works of the day. Museum PF3.*

Twelve months were to pass before Tank No 3 was ready, 12 August 1929 and a further two months before No. 4 was ready on 16 October. The 450 ton petrol tank in the railway yard was completed in 1928 but not filled immediately. (OFI Register).

With the tanks installed strategists called for their protection and men were brought from the Garrison on Thursday Island, with timber from demolished barracks and the last of the Island's coal. Their task was to build 6 inch gun batteries and search-light installations.



*Excavations for oil pipe lines. Museum PF8.*



By 1932 a decision was made to increase the number of tanks to nine and to re-open the Naval Reserve in 1934 under DNO Lt. Com. Jarret after twelve years of inactivity.

Tanks Nos. 5 and 6 followed on around the foreshore towards the wharf and Nos. 7, 8 and 9 formed a new line to the west from No. 3 in that order.

A tender of H. Snell and Co. for the excavation of Tanks 5 and 6 was accepted (N.S. 1 November 1932) but excavations for No. 5 were disrupted when Snell was hit on the arm and back by flying blasting debris whilst sheltering beneath his lorry. (N.S. 7 February 1933).

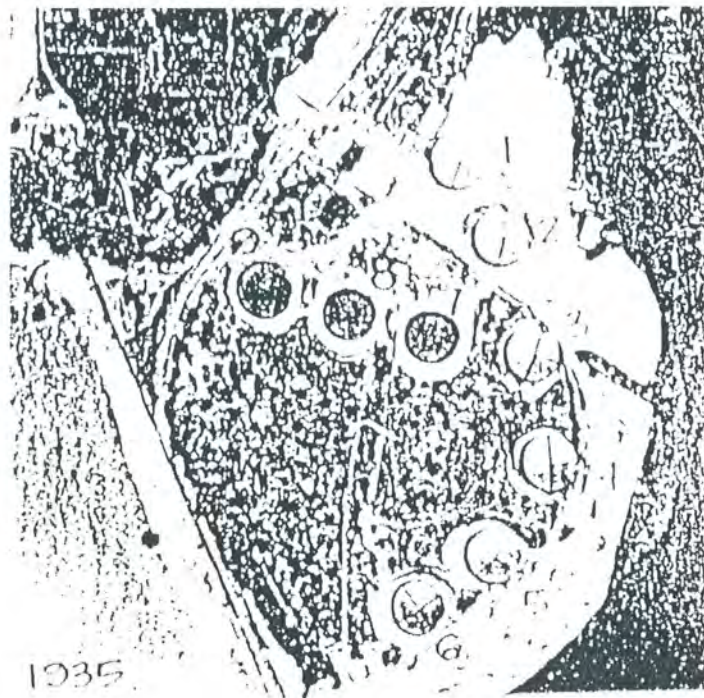
Three weeks later Paul Abala, one of Snell's men, was hit by falling rock and suffered a fractured skull, a broken collar bone and shoulder blade and three cracked ribs. Obviously no malingerer he was back at work two months later. (N.S. 25 April 1933).

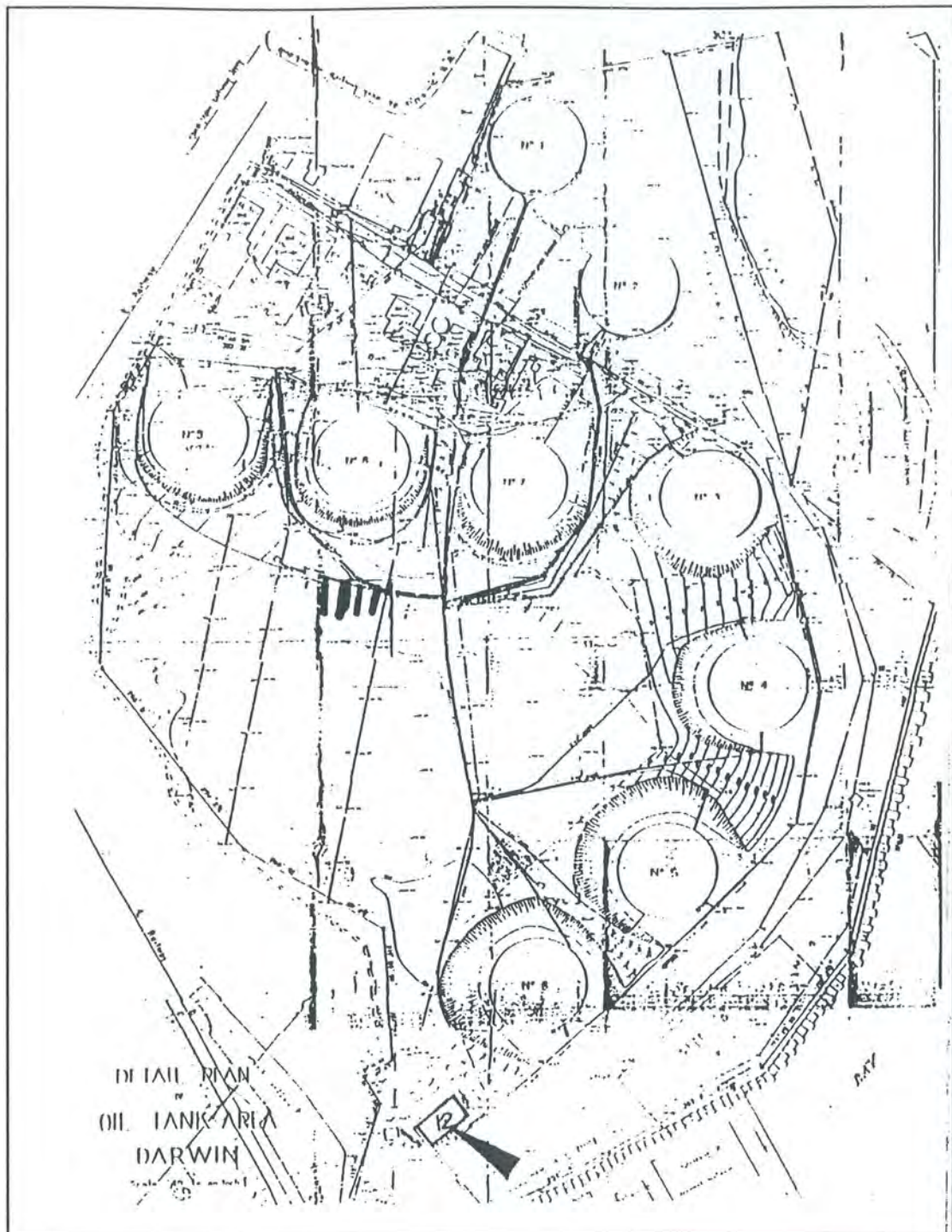
Sand bedding for both tanks was carted from below high water level from Mindil Beach.

Tank No. 5 was filled in April 1934 and No. 6 was filled in June.

A contract worth £36,859 was let to Evans Deakin and Co. Ltd. for Tanks 7, 8 and 9 which were to be electrically welded. (Commonwealth Gazette No. 72, 1 November 1934).

No time was wasted as the last tank, No. 7, was filled on 31 March 1936 from Tank No. 8 which itself had been first filled on 16 November 1935. (OFI Register)





December 1936 Detail Plan, Neg. No. 9251. Hulk of the "Warrego" is shown east of Tank No. 3. Steam Pump House shows to south west of Tank No. 6.



With war all but imminent Evans Deakin were given another contract for two more tanks, Nos. 10 and 11 for £30,778. (N.S. 12 May 1939)

Tank No. 11 was filled first on 18 November 1941 followed by No. 10 on 2 December. (OFI Register)

On 16 February 1942, the ill fated tanker "British Motorist" delivered 10,895.59 tonnes of Iranian oil to Tank No. 10. Three days later, on the 19th, two of her crew were dead and she was on the bottom of Darwin Harbour, hit twice by Japanese bombs.

Another victim of this raid was Tank No. 6 which lost 117.6 tonnes of oil (ibid.)

Notwithstanding it held enough oil to supply USAAF 800th. Engineers with 286.69 tonnes on 31 March.

This was an ill fated tank as it and Tank No. 4 were both destroyed on 15 March 1943. Tanks 1 and 2 were hit but the bombs failed to explode. Tank No. 7 and the railway yard tank were strafed.

As luck would have it Tanks 1 and 7 were empty at the time. Prior to this Tanks 10 and 11 were totally destroyed and Tanks 3 and 9 damaged in Raid No. 19 on the 16 June 1942 (ibid).

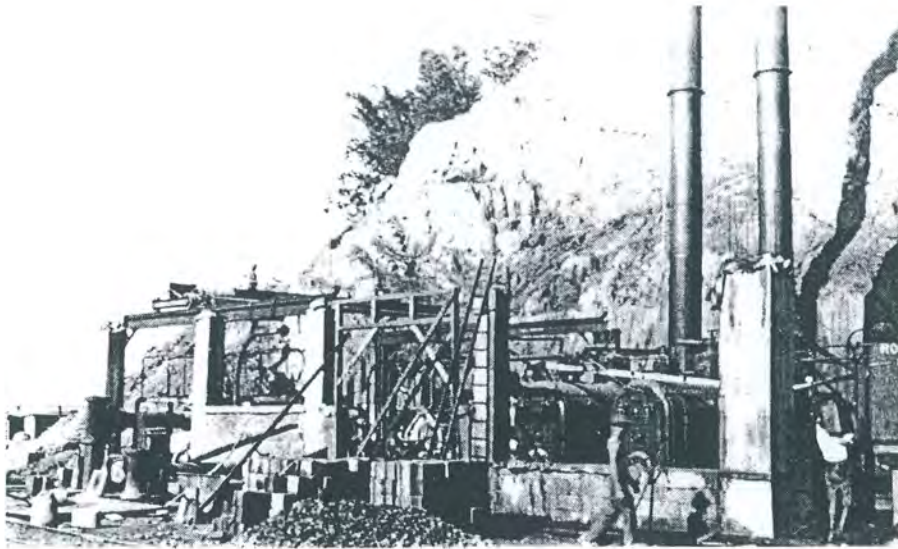


*Tanks 10 and 11 totally destroyed on 16 June 1942*

## DETAILED BUILDING HISTORY

The building was constructed for the Royal Australian Navy under the aegis of the Commonwealth Department of Works and Railways.

Photographs indicate the early erection of the reinforced concrete columns of the building and travelling beam crane with its associated steel columns and rails. This sequence of erection allowed the installation of major mechanical equipment items such as the original twin boilers and existing twin duplex pumps to proceed before the entire restrictions of the building fabric interfered with access.



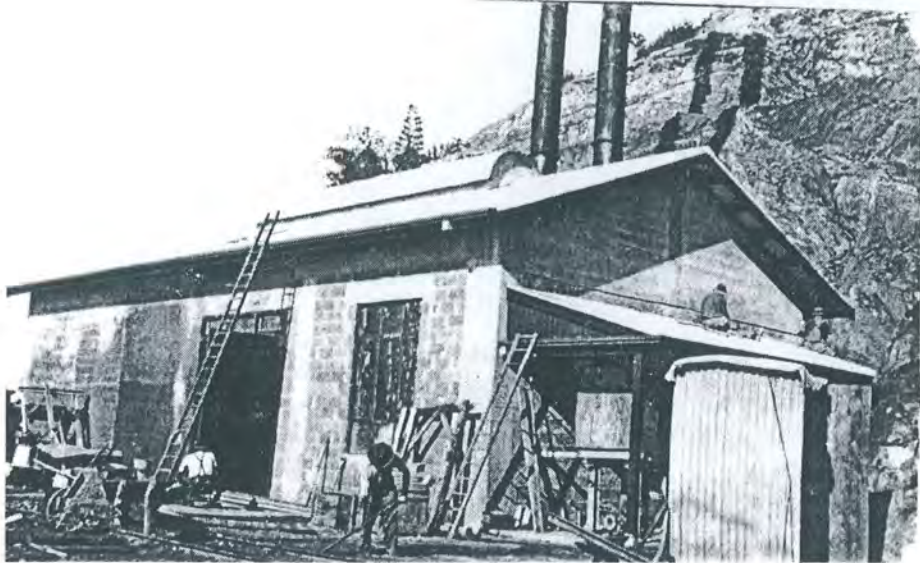
*Begun in late 1927, this 31.1.28 photograph shows machinery installed before completion of walls and roof. N.T. Museum col. PF7*

Infill wall panels are concrete block, bag rendered on both sides. Steel trusses are centred on the reinforced concrete columns in the location of the beam crane but land on the bond beam elsewhere for some strange reason.

Wood purlins and corrugated galvanised iron complete the roof structure. An arched ridge vent was originally fitted but has now been removed.



A lean-to roof was constructed on the north end over elevated, square, steel 1818 litre fuel tanks. Boiler fuel was drawn from the product.



*Finishing touches being made to the building  
on 23 March 1928.  
N.T. Museum col PF14*

Blast walls were constructed on three sides of the building under the same contract which provided same for oil tanks Nos. 1 – 11 in 1942-43.

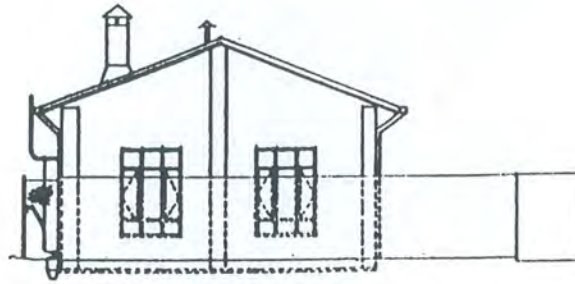
The apparent lack of blast wall to the west boundary and parts of the north and south boundaries is no coincidence as the original building was constructed within a quarried out insert in Stokes Hill and the blast walls finished against the hill.

The building lacks architectural style and evidence of innovative thinking. It shows a rather ad hoc approach indicating, perhaps, a lack of detailed drawings or changes brought about on site by non delivery of certain essential materials or equipment.

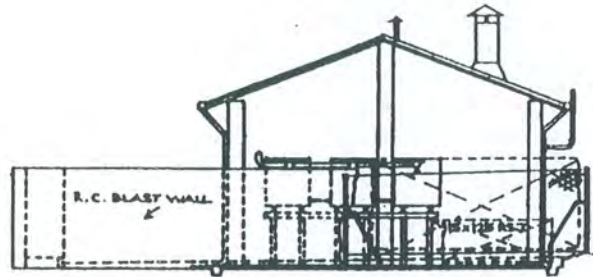
The photograph shows the evident disregard of block sizes in the selection of window and door dimensions which led to unnecessary cutting of blocks and poor final detailing.







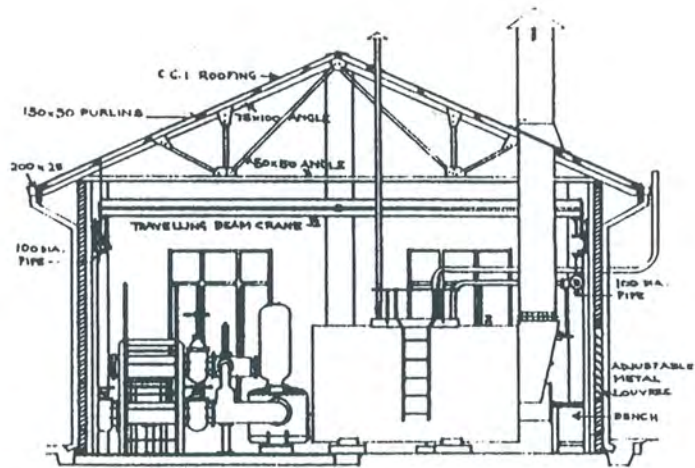
SOUTH ELEVATION



NORTH ELEVATION



SCALE

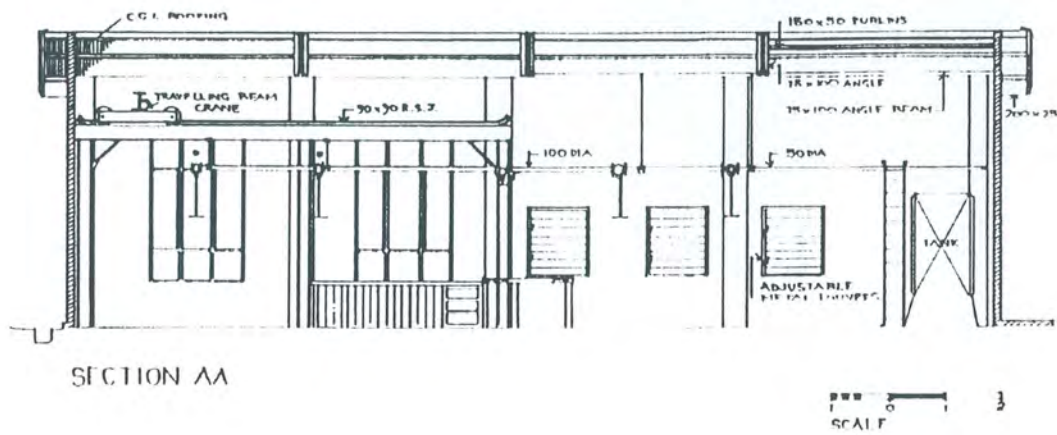


SECTION BB



SCALE

MEASURED DRAWING



MEASURED DRAWING





*North-eastern corner shows outline of demolished  
lean-to roof. Dermoudy 3.89*



*West Elevation from Stacking Yard. Dermoudy 3.89*



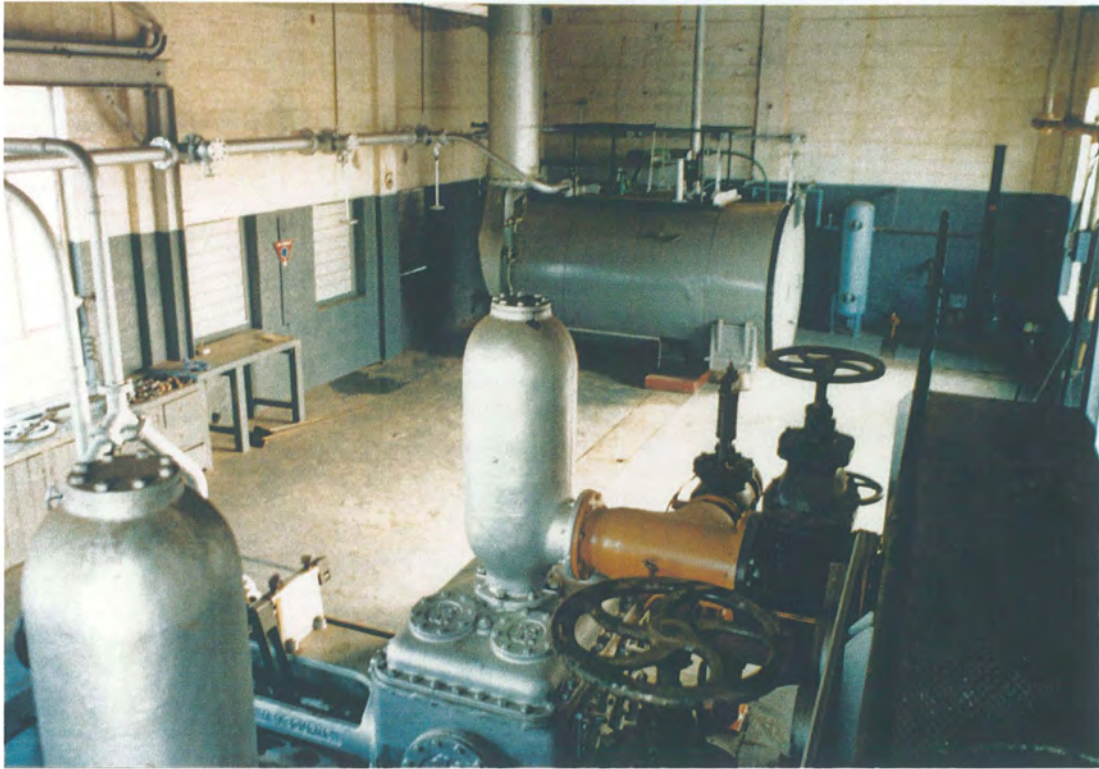


*North elevation. Ships tanks and water tank from excavated hill, relic of lean-to shelter. Dermoudy 4.89*



*Detail of gutters. Dermoudy 4.89*





*Interior looking north from catwalk. Dermoudy 4.89*



*Interior looking south. Dermoudy 4.89*

Following further excavation of Stokes Hill to form the Port Authority stacking yards in 1968/69 and 1974, security of the enveloping hill was lost and replaced with a cyclone wire fence.

The square sectional tank now located on the north end of the building was relocated from its original elevated location on Stokes Hill during the subsequent excavations.

### **CONDITION**

Serious spalling of the reinforced concrete columns is the only apparent structural defect.

The seriousness of the defect as a reason to abandon the building is difficult to assess because the concrete block infill panels are probably quite capable of supporting the building without the columns to a certain degree.

Certainly sufficiently to allow replacement of the columns one by one without trauma to the building. Moderate rusting of steel window frames and sashes, trusses, crane components etc is controllable if taken in hand without delay.



## DETAILED MACHINERY HISTORY

### BOILERS

The original pair of boilers were replaced with a single scotch marine type boiler, c1963, by a "Major", manufactured by Johnsons Tyne Foundry Pty Ltd. of South Melbourne.

Its certified capacity is notified as 60m<sup>2</sup> - 1160k with a working pressure of 689 kpa. It was last certified in good working order on 6 July 1987.

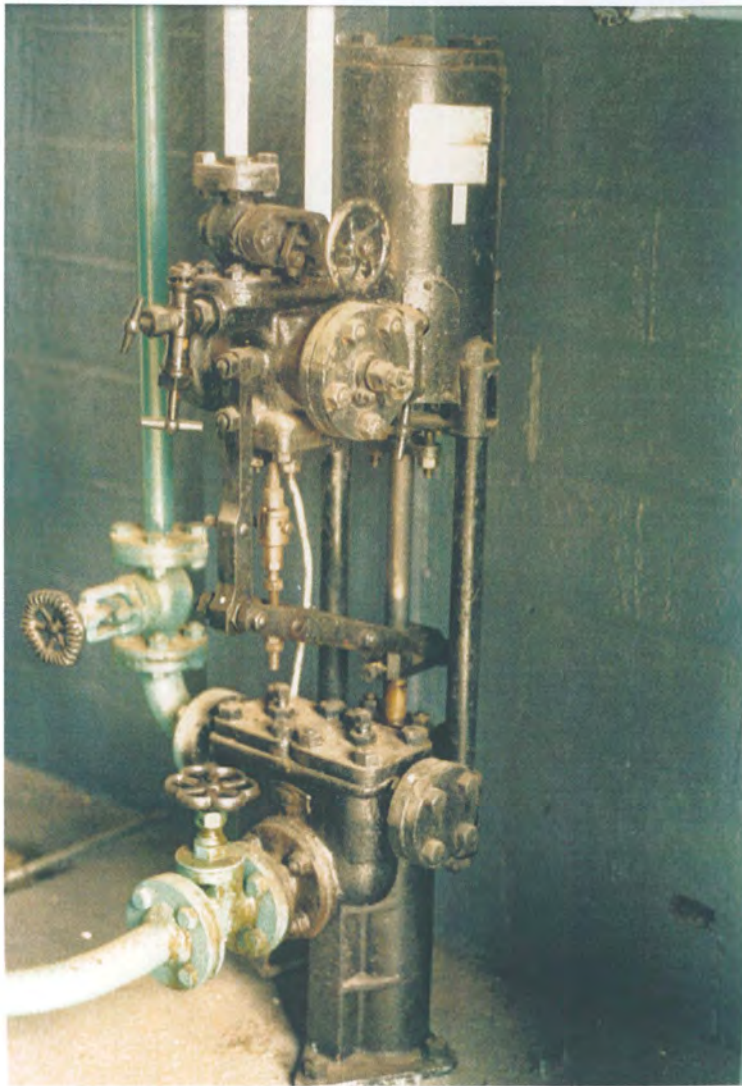
### BOILER PUMPS

Two Weir brand steam operated pumps originally installed as water make-up pumps for the twin boilers still remain. These pumps are in good operating condition, presently manifolded to serve the "new" single boiler.

They were manufactured by G. & J. Weir Ltd. of Cathcart, Glasgow. No. 30243 was manufactured in 1925 and No. 31507 was manufactured in 1926.



*Water tank, Weir pumps and air receiver. Dermoudy 4.89*



*Detail of 1925 WEIR pump. Dermoudy 4.89*

### **LISTER DIESEL**

The present (1989), two cylinder Lister Model HDA No. 3370 ST 150 diesel replaced a single cylinder engine of like made in 1971/72 (Pers. Com. Barry Munt). The diesel engine drives a Broomwade two cylinder air compressor to provide atomising air for the boiler's oil burner until a sufficient head of steam is raised to operate a steam injected blower which takes over and allows the diesel engine to be stopped.

The engine, compressor and air receiver are sound.



## KELLY AND LEWIS 15 INCH DUPLEX STEAM DRIVEN OIL PUMPS

Two pumps and various accessories were supplied to the Department of Works and Railways in 1927 under Work Order 101419.

Messrs. Thompson, Kelley and Lewis were able to supply drawings, spares, tools and parts lists which comprised that order.



*Overhead view of the two duplex pumps. Dermoudy 4.89*

The pumps were tested in March 1928 and completed their first task on 16 July 1928 when they pumped 7,896 tonnes of Borneo Oil into Tank No. 1 from the tanker War Krishna.

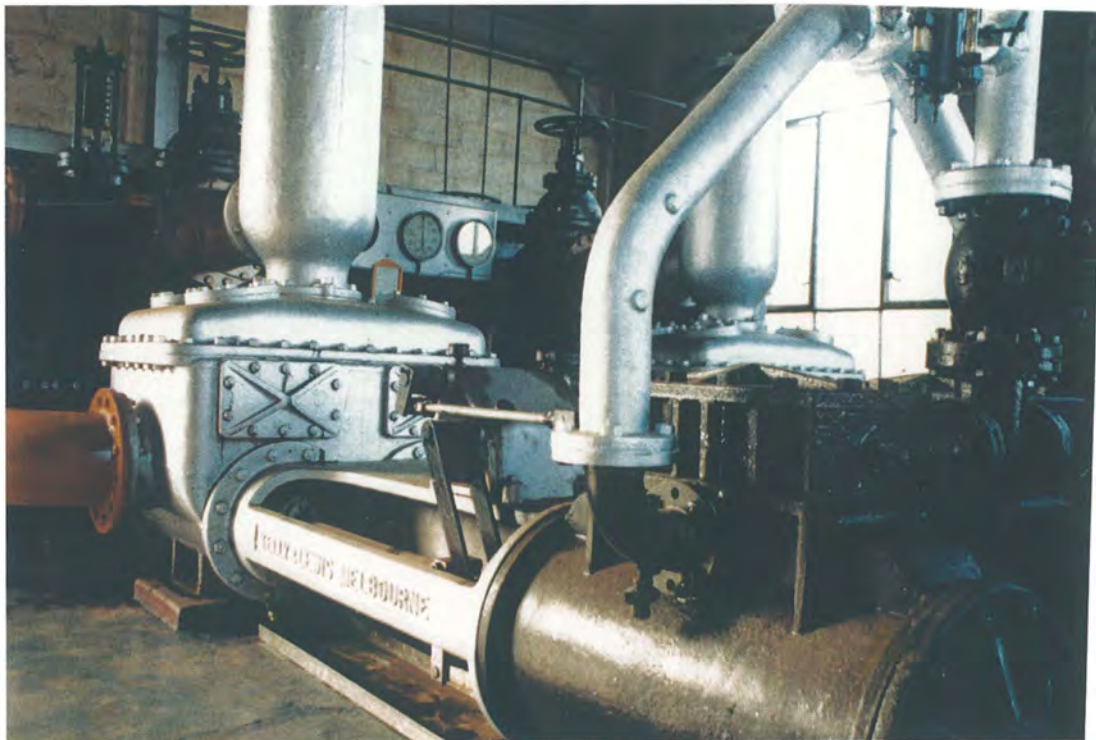
They then operated on a full time basis up until the end of WW11 when their duty was periodically taken over by an electric pump installed in the new pump chamber of Nos. 10 and 11 Safe Oil Storage Tunnels.

Apart from periodic testing the last time they worked was when the electric pumps failed whilst refuelling HMS Britannia on 16 – 18 March 1963 and the system had to fall back onto steam power.

The pumps were finally disconnected from the oil lines in February/March 1989.

New electric pumps in the OFI and the “old” one in the tunnels now carry on the task.

The pumps when last tested on 6 July 1989 were in good order.

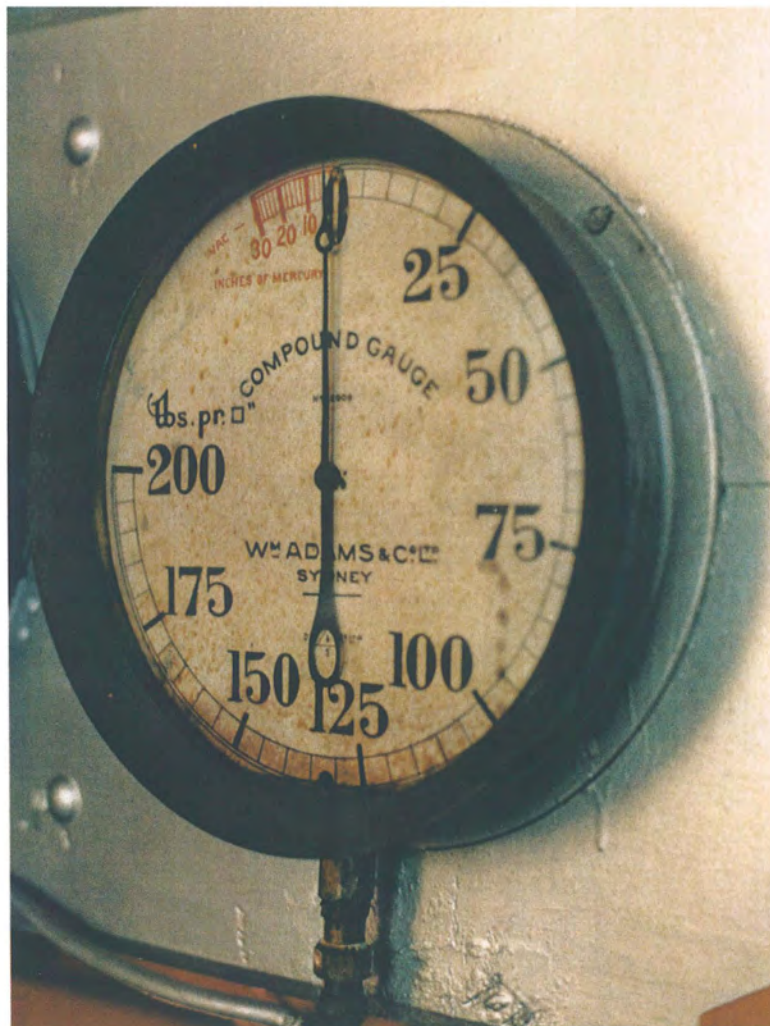


*Derham 4.89*





*Detail of pumps and gauge. Dermoudy 4.89*



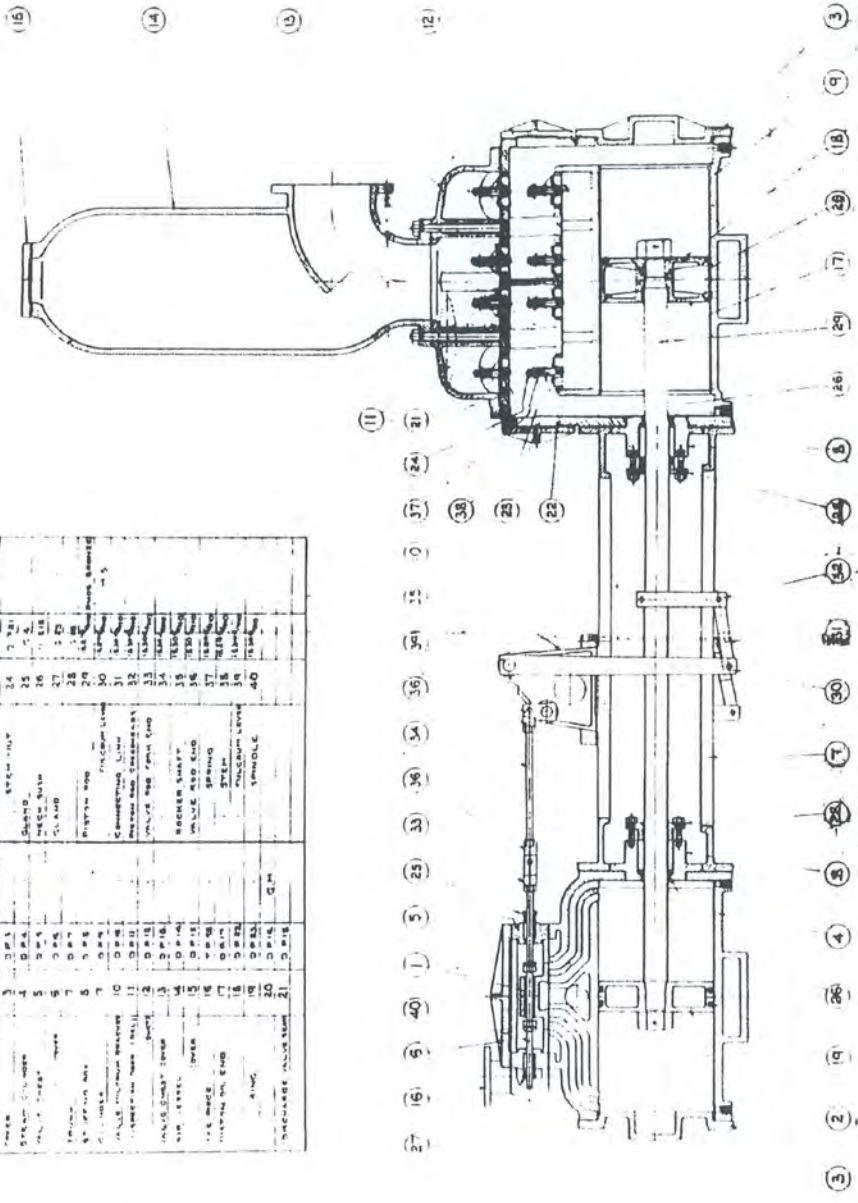




# ARR. OF STEAM DRIVEN DUPLEX OIL PUMP.

SCALE 1/4" = 1 FOOT.

Part	Material	Quantity	Notes
1	Cast Iron	1	Body
2	Cast Iron	1	Head
3	Cast Iron	1	Base
4	Cast Iron	1	Frame
5	Cast Iron	1	Support
6	Cast Iron	1	Bracket
7	Cast Iron	1	Arm
8	Cast Iron	1	Link
9	Cast Iron	1	Pin
10	Cast Iron	1	Washer
11	Cast Iron	1	Nut
12	Cast Iron	1	Key
13	Cast Iron	1	Shaft
14	Cast Iron	1	Gear
15	Cast Iron	1	Valve
16	Cast Iron	1	Seat
17	Cast Iron	1	Stem
18	Cast Iron	1	Washer
19	Cast Iron	1	Nut
20	Cast Iron	1	Key
21	Cast Iron	1	Shaft
22	Cast Iron	1	Gear
23	Cast Iron	1	Valve
24	Cast Iron	1	Seat
25	Cast Iron	1	Stem
26	Cast Iron	1	Washer
27	Cast Iron	1	Nut
28	Cast Iron	1	Key
29	Cast Iron	1	Shaft
30	Cast Iron	1	Gear
31	Cast Iron	1	Valve
32	Cast Iron	1	Seat
33	Cast Iron	1	Stem
34	Cast Iron	1	Washer
35	Cast Iron	1	Nut
36	Cast Iron	1	Key
37	Cast Iron	1	Shaft
38	Cast Iron	1	Gear
39	Cast Iron	1	Valve
40	Cast Iron	1	Seat
41	Cast Iron	1	Stem
42	Cast Iron	1	Washer
43	Cast Iron	1	Nut
44	Cast Iron	1	Key
45	Cast Iron	1	Shaft
46	Cast Iron	1	Gear
47	Cast Iron	1	Valve
48	Cast Iron	1	Seat
49	Cast Iron	1	Stem
50	Cast Iron	1	Washer
51	Cast Iron	1	Nut
52	Cast Iron	1	Key
53	Cast Iron	1	Shaft
54	Cast Iron	1	Gear
55	Cast Iron	1	Valve
56	Cast Iron	1	Seat
57	Cast Iron	1	Stem
58	Cast Iron	1	Washer
59	Cast Iron	1	Nut
60	Cast Iron	1	Key
61	Cast Iron	1	Shaft
62	Cast Iron	1	Gear
63	Cast Iron	1	Valve
64	Cast Iron	1	Seat
65	Cast Iron	1	Stem
66	Cast Iron	1	Washer
67	Cast Iron	1	Nut
68	Cast Iron	1	Key
69	Cast Iron	1	Shaft
70	Cast Iron	1	Gear
71	Cast Iron	1	Valve
72	Cast Iron	1	Seat
73	Cast Iron	1	Stem
74	Cast Iron	1	Washer
75	Cast Iron	1	Nut
76	Cast Iron	1	Key
77	Cast Iron	1	Shaft
78	Cast Iron	1	Gear
79	Cast Iron	1	Valve
80	Cast Iron	1	Seat
81	Cast Iron	1	Stem
82	Cast Iron	1	Washer
83	Cast Iron	1	Nut
84	Cast Iron	1	Key
85	Cast Iron	1	Shaft
86	Cast Iron	1	Gear
87	Cast Iron	1	Valve
88	Cast Iron	1	Seat
89	Cast Iron	1	Stem
90	Cast Iron	1	Washer
91	Cast Iron	1	Nut
92	Cast Iron	1	Key
93	Cast Iron	1	Shaft
94	Cast Iron	1	Gear
95	Cast Iron	1	Valve
96	Cast Iron	1	Seat
97	Cast Iron	1	Stem
98	Cast Iron	1	Washer
99	Cast Iron	1	Nut
100	Cast Iron	1	Key



W. KELLY & CO. ENGINEERS  
101 N. 3rd St.  
PITTSBURGH, PA.

## **SIGNIFICANCE**

This building and its contents, as an integrated unit, has high significance from a heritage and industrial technology point of view.

As part of the 1926 physical change-over of strategical refuelling bases from Thursday Island to Darwin the complex represents an important milestone in not only Darwin's history but the history of the Royal Australian Navy and the Royal Navy. It also directly led to the creation of a fortress for the first time in Darwin as part of the developing nature of Australian Defence Strategies.

An excellent opportunity to preserve a fully operational steam pump house in a location unique to Darwin's history now presents itself. It forms an important link with the Darwin waterfront, the 1926 oil tanks and World War II Safe Oil Storage Tunnels under the City.

## **CONSERVATION**

The building and its contents should remain in-situ.

A sequential replacement of reinforced concrete columns should be made replacing reinforcing rods with galvanised rods.

Rust proofing of steel components to be carried out. Periodic running of the machinery be carried out with steam until unpractical due to boiler deterioration, thence by compressed air.



PARTS AND SPARES LIST FOR ORDER NO. 10149

1927

## 2 STEAM DRIVER HORIZONTAL DUPLEX OIL PUMPS

for the Dept. of Works & .....

18230/910	D, P, 1	4 Valves (Steam)	C.I.
18228/910	D, P, 2	4 Pistons (Steam)	C.I.
18229/910	D, P, 3	8 Covers	C.I.
18243/910	D, P, 4	4 Cylinders (Steam)	C.I.
18246/910	D, P, 5	4 Valve Chasie	C.I.
18247/910	D, P, 6	4 Valve Chest Covers (Steam)	C.I.
18249/910	D, P, 7	8 Trunks	C.I.
18250/910	D, P, 8	8 Stuffing boxes	C.I.
18252/910	D, P, 9	2 Cylinders (Oil)	C.I.
18258/910	D, P, 10	2 Valve Fulcrum Brackets	C.I.
18264/910	D, P, 11	8 Inspection Doors (Delivery)	C.I.
18265/910	D, P, 12	8 Inspection Doors (section)	C.I.
18266/910	D, P, 13	2 Valve Chest Coves (Oil)	C.I.
18269/910	D, P, 14	2 Air Vessels	C.I.
18272/910	D, P, 17	4 Oil Pistons	C.I.
	X XXX		
18277/910	R, F, 58	2 Tee Pieces	C.I.
13694/426	F, F, 27	2 x 5" Blank Flanges	C.I.
18308/910	D, P, 23	8 Piston Rings	C.I.
6115/6	G, 4,	4 x 7/8" Glands (stock)	C.K.
8555/6	G, 23	4 x 3/4" Glands (stock)	C.M.
6126/6	G, 16	8 x 3" Glands	C.M.
18271/910	D, P, 16	4 x Piston Rings	G.M.
18292/910	D, P, 18	72 Valve seats (Dis.....)	G.M.
18293/910	D, P, 19	72 Valve seats (.....)	G.M.



19294/910	D, P, 20	216 Valves (Oil) 72 spares	G.K.
18295/910	D, P, 21	144 Valve st h	G.M.
7893/15	N, S, 18	8 x 3" Rack Bushes	G.M.
		144 x 5/8" .....	G.M.
18273/910	D, P, 24	8 x 2 1/2" Hex ....	Bronze
18273/910		4 Piston Rods 0 8 9 5/8" 3 1/4" Dis	.....
18252/910		4 Oil Cylinder Liners (ordered by D.O.)	5/16 .... brass sheet
18297/910		2/6 Valve springs (ordered by D.O.) 72 spares	Spring steel
18296/910		144 Valve stems @ 5" of .....	Bright
18298/910		2 Piston Rod F ..... Levers	
18298		2 Piston Rod Ful..... Levers	
18299/910		2 Valve ..... Levers	
18299/910		2 Valve F..... Levers	
18300/910		4 Piston Rod C	
18299/910		4 Pins for Valve F Levers	
18301/910		4 Valve Spindles	
18302/910		2 Valve Rods as 18" of 7/8	
18302/910		2 Valve Rods as 24" of 7/8	

18303/910 .. Valve Rod Ends

18304/910 4

18305/910 4

18306/910 4 Valve

18306/910 4 Pins for

18273/910 8 Pins for Piston Rods